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**Preliminary echo integration-trawl survey results for walleye pollock
(*Theragra chalcogramma*) in the Shumagin Islands, Pavlof Bay,
and Sanak Trough during February, 2002**

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INTRODUCTION

Scientists from the Midwater Assessment and Conservation Engineering (MACE) Program of the Alaska Fisheries Science Center conduct research surveys of Gulf of Alaska walleye pollock (*Theragra chalcogramma*) to estimate pollock distribution and abundance. Preliminary cruise results presented here are from the echo integration-trawl (EIT) survey carried out between 10 and 16 February, 2002, in the Shumagin Islands, Pavlof Bay and Sanak Trough. The primary cruise objective was to assess the abundance and distribution of pollock. This report summarizes observed pollock distribution, relative abundance, size composition, sex ratio and maturity information. Biomass estimates, acoustic system calibration results, and other cruise results will be reported in a subsequent document.

METHODS

Itinerary

10 Feb	Embark scientists in Sand Point, AK; calibration of acoustic systems in Sanborn Harbor, AK
10-14 Feb	EIT survey of the Shumagin Islands

14-15 Feb	Exploratory surveys of Pavlof Bay and Sanak Trough
16 Feb	Arrive Dutch Harbor; disembark portion of scientific party; end of cruise

Acoustic Equipment

Acoustic data were collected with a Simrad EK 500¹ quantitative echo-sounding system on the NOAA ship *Miller Freeman*, a 66-m stern trawler equipped for fisheries and oceanographic research. Two split-beam transducers (38 kHz and 120 kHz) were mounted on the bottom of the vessel's centerboard extending 9 m below the water surface. System electronics were housed inside the vessel in a permanent laboratory space dedicated to acoustics. Data from the echo sounder were logged and processed using Simrad BI500 echo integration and target strength analysis software on a SUN workstation. Results presented here are based on the 38 kHz data. Acoustic data were also collected at 38 and 120 kHz frequencies with a new acoustic system (Simrad EK60 echosounder, Sonardata Echologger, and Echoview post-processing software) to compare with the primary acoustic system for testing.

Trawl Gear and Oceanographic Equipment

Two trawl nets were used to sample observed echosign. Midwater and near-bottom echosign was sampled with an Aleutian Wing 30/26 trawl (AWT). Demersal echosign was sampled with a poly nor'eastern bottom trawl with roller gear. Vertical and horizontal net opening and depth were monitored with a Wesmar third wire netsounder system or a Furuno netsounder system attached to the headrope on all hauls. Both nets were fished with 5 m² Fishbuster trawl doors (1,250 kg).

Physical oceanographic data collected throughout the cruise included temperature/depth profile data obtained by attaching a Seabird SBE39 micro bathythermograph to the trawl headrope and conductivity-temperature-depth (CTD) data collected with a Sea-Bird CTD system at the calibration site and other selected locations. Sea surface temperature, salinity, and other environmental data were also collected and logged using the NOAA ship *Miller Freeman's*

¹ Reference to trade names or commercial firms does not constitute U.S. Government endorsement.

Scientific Computing System (SCS). An acoustic Doppler current profiler, which was slaved to the EK500 to avoid interference, operated continuously at 150 kHz throughout the cruise in the water profiling mode.

Survey Design

In the Shumagin Islands area, parallel transects were spaced 9.3 km apart in Shumagin Trough and 5.9 km elsewhere (Fig. 1). An exploratory zig-zag pattern was used in Pavlof Bay and Sanak Trough. Echo integration and trawl data were collected 24 hours a day. Acoustic system settings were based on results from standard sphere calibrations and instrument performance during previous surveys. Trawl hauls were conducted to identify echosign and to provide biological samples. The net reel malfunctioned on February 13, which resulted in the suspension of trawling operations for the remainder of the cruise. Pollock were sampled to determine sex, fork length, body weight, age, maturity, and ovary weight of selected females. Fork lengths were measured to the nearest cm. Maturity was determined by visual inspection and categorized as immature, developing, pre-spawning, spawning, or post-spawning.

Data Analysis

Acoustic data were collected between 14 m of the surface and 0.5 m of the bottom. Echosign data identified as pollock were stored in a relational database. Trawl haul catches were examined to define geographical areas with similar length distributions.

PRELIMINARY RESULTS

Biological sampling

Biological data, including those for ancillary research projects, were collected from one bottom trawl and five midwater trawl hauls (Table 1, Fig. 1). The net reel malfunction prevented trawling operations from occurring in Shumagin Trough, Pavlof Bay, and Sanak Trough.

Distribution

A distributional plot of the acoustic backscattering attributed primarily to pollock indicated that the densest aggregations were distributed off Renshaw Point and east of Unga Island (Fig. 2). Pollock were generally within 50 m of the sea floor. Lesser amounts of pollock echosign were distributed off of Swedania Point and in Shumagin Trough. High densities of echosign believed to be pollock were observed in Pavlov Bay and Sanak Trough, although no confirmation trawls were conducted.

Trawl hauls conducted off of Renshaw Point and east of Unga Island contained mostly adult² pollock (hauls 1, 3, 4, and 5 in Fig. 3). In these trawl hauls, the catches contained predominantly male pollock. Haul 2, conducted off of Swedania Point, caught mostly 2-year old pollock. Haul 6, conducted in a midwater layer off of Renshaw Point at about 100-150 m depth, contained a mixture of mostly 2- and 3-year old pollock. The unweighted maturity composition for males longer than 40 cm was 0% immature, 2% developing, 72% mature pre-spawning, 15% spawning, and 11% spent (Fig. 4). The female maturity composition of fish longer than 40 cm was 0% immature, 10% developing, 78% pre-spawning, 5% spawning, and 8% spent. Among pollock sampled that were smaller than 40 cm long, 96% were immature or developing. Female pollock were estimated to be 50% mature at a length of 44 cm FL (Fig. 5). The mean GSI for mature pre-spawning females was 0.17 (Fig. 6).

²Because age data are not yet available, length ranges were used as a proxy for age based on length at age from previous surveys. Pollock between 9-16 cm fork length (FL) are considered 1-year olds, most pollock between 17-25 cm FL are considered 2-year olds, most pollock from 26-35 cm FL are considered 3-year olds, and most pollock exceeding 35 cm FL are considered adults.

SCIENTIFIC PERSONNEL

<u>Name</u>	<u>Sex/Nationality</u>	<u>Position</u>	<u>Organization</u>
Michael Guttormsen	M/USA	Chief Scientist	MACE
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Stephane Gauthier	M/Canadian	Fish. Biologist	UW
Mike Bancroft	M/USA	Naval Architect	JJMA

Abbreviations:

JJMA - John J. McMullen Associates, Inc., Pascagoula, MS

MACE - Midwater Assessment and Conservation Engineering Program, Alaska Fisheries Science Center, Seattle, WA

UW – University of Washington, Seattle, WA

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